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VALLEY-HEAD CLOUD WINDOWS

By RONALD L. IVES

[Boulder, Colo., September 1938]

"Windows," which hold their positions, regardless of cloud motion, have been observed in the cloud strata over the heads of many glaciated valleys in the Colorado Front Range area.

Observations during the summer of 1938, when abnormal wetness in the foothills and on the adjacent plains increased the cloudiness on the east flank of the Front Range and broke up the normally present "convection sheets" into valley winds, indicate that the cloud windows are caused by these valley winds.

Following the courses of the valleys upward from the plains, the winds have a temperature at 12,000 feet of about 75°. Mountain air, at the same time and elevation, has a temperature of about 50°, and has a greater humidity than the valley air.

Cloud strata are at 12,500 to 13,000 feet and 14,000 to 16,000 feet: The lower stratum being confined closely to the range; the upper stratum covering the parks between the ranges, and sometimes extending several miles over the plains.

Valley winds, on reaching the cirques at the valley heads, are diverted sharply upward, and the clouds are evaporated

as the winds rise through them. Clouds that drift into these updrafts are immediately dissipated. No cloud

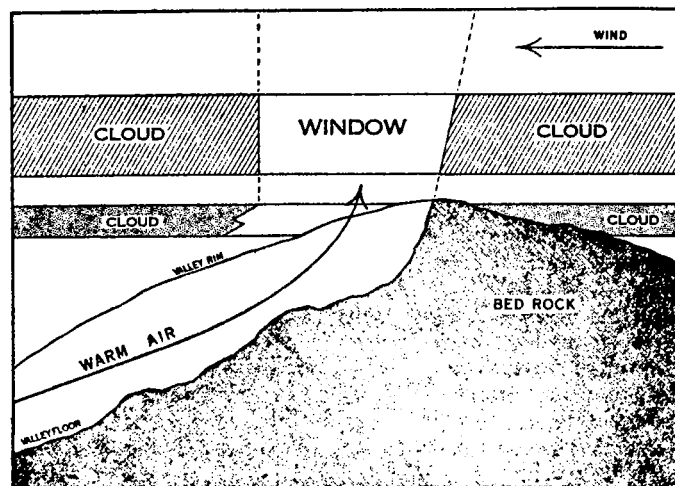


FIGURE 1.—Typical valley-head cloud window.

wisps are formed over the cloud windows, even in the cold stratum above 16,000 feet, indicating that the humidity of the uprising valley air is low, even after it has absorbed the moisture contained in many cubic feet of cloud.

The occurrence of nonmoving windows in the cloud strata of a mountain region should, therefore, immediately suggest the presence of warm, upward-diverted valley winds.

DUSTSTORMS OF 1938 IN THE UNITED STATES

By ROBT. J. MARTIN

[Weather Bureau, Washington, February 1939]

The duststorms of the year just ended were far less extensive and noteworthy than in several preceding years,¹ but there were some sections of the country, particularly in the Dust Bowl itself and locally to northward, where occasional storms were as severe as any reported during recent years. The most severe storms generally came early in the year, particularly during the winter and early spring months when winter wheat was most susceptible to damage from drifting soil. Reports were all too frequent of tender growth being cut and eroded away by flying grains of sand or of young growth being buried.

While there were a few reports of dust being observed in central and eastern sections of the country, especially during March and May, and locally in several other months, duststorms were not nearly so widespread as in 1934, 1935, and 1936.

January.—Precipitation during January was subnormal in more than half the country with the greatest deficiencies noted in portions of the Plains States, the upper Mississippi Valley, the Southwest, the northern Rocky Mountain region, and the Pacific States. Portions of Kansas and Nebraska had only 3 to 25 percent of the normal January fall. Precipitation was normal or decidedly above in a wide belt reaching from the Rio Grande Valley in Texas eastward and northeastward and several stations in southwestern Texas, southeastern New Mexico, Arkansas, Iowa, and Wisconsin had more than 200 percent of normal precipitation.

Because of dry subsoil and greatly subnormal rain and snow, duststorms were rather numerous and severe during January in portions of the Dust Bowl. Some damage was done by shifting soil in Nebraska and duststorms were especially severe in Kansas on the 13th of the month, resulting in considerable deterioration of winter wheat. Some grain was blown out in western Oklahoma and some in sandy lands of the Northwest. New Mexico had duststorms during the week ending January 18.

During the following week heavy duststorms were noted in western Kansas and on several days in western Oklahoma. There was also some damage by high winds and drifting soil in western portions of New Mexico, Colorado, and Wyoming, and locally in Montana and Nebraska.

During the following week considerable damage resulted from blowing in west-central and northwestern Oklahoma; duststorms in western Kansas, with considerable soil movement, injured winter wheat in several southwestern counties. Less extensive damage was reported in the Northwest, but Wyoming indicated some injury to grains from this cause. Rather severe storms

The type location for these cloud windows is the head of Fourth of July Gulch, Boulder County, Colo.; lat. 40°01' N., long. 105°41' W.; shown on the U. S. G. S. Rocky Mountain National Park quadrangle. These observations were made during the progress of research assisted by the Penrose Fund of the American Philosophical Society. The writer is indebted to Bruce R. Snow, of the University of Colorado, for check observations.

were experienced in eastern New Mexico. Over the northern Great Plains light dust was reported as far north as Montana and in extreme western Minnesota on the 24th. Light dust was noted as far east as Tennessee on the 12th and 18th and was also reported during the latter part of the month in portions of Illinois and Mississippi.

In southern sections of the Great Plains light dust was reported on as many as 9 days, nearly all during the latter half of the month. Brownsville, Tex., had light dust on 3 days. The storms were most severe in the Dust Bowl, that is, portions of western and southwestern Kansas, western Oklahoma, northwestern Texas, northeastern New Mexico, and southeastern Colorado. In western Kansas, particularly in the areas around Sublette, the dust movement was sufficient to cause marked delay in transportation schedules. A train of the Dodge City and Cimarron Valley branch of the Santa Fe was delayed 18 hours by impassable drifts of dust. A combination snow and dust plow was required to clear a pile of dust 3 to 6 feet deep and 1,400 feet long from the tracks. At times during these storms, not only in Kansas, but in other portions of the Dust Bowl, and locally as far north as Wyoming, visibility was reduced to zero, flying schedules were canceled, street lights were necessary and a marked increase in respiratory troubles was reported. Several deaths occurred from automobile accidents during the times of least visibility.

In Colorado a heavy "duster" on the 16th covered practically all southeastern counties and on the 23rd swirling clouds of dust continued for 60 consecutive hours, reducing visibility to zero or one city block throughout Baca and eastern Prowers Counties. The damage with respect to soil erosion was noteworthy during this storm.

The observer at Goodwell, Okla., reported 7 days with heavy dust and several days on which visibility was 75 feet or less. The storms of the 24-25th were the most severe in northwestern Oklahoma and, according to competent authority, were the worst ever experienced in that section.

February.—February brought good rains or snows to most of the Plains States, particularly Texas, Oklahoma, Kansas, and portions of the Dakotas and Nebraska. Much of the precipitation was in the form of snow which aided materially in reducing the number of duststorms. Because of insufficient precipitation in portions of Colorado dust blowing caused considerable damage to wheat in Las Animas County and a large acreage in the western part of the State was abandoned. Generally, the rains of the month were not sufficient to restore deficient subsoil moisture, however, and there was no permanent let up in soil blowing.

The presence of dust in the upper atmosphere was shown by highly colored sunrises and sunsets as far east as Reading, Pa. At Marquette and Sault Ste. Marie, Mich., dust

¹ For accounts of previous duststorms, see the following Reviews: 1934, January and May; 1935, February to May, inclusive; 1936, March, May, and December; 1937, April.